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Transportation
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HighwaySafetyLiterature

. . . A SEMI-MONTHLY ABSTRACT JOURNAL

73-6

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Corporate Author: Contact corporate author.

Reference Copy Only: Consult your librarian.

Journal Citation: Obtain through normal loan or purchase.

SAE: Society of Automotive Engineers, Dept. HSL, 2 Pennsylvania Plaza, New York, N.Y. 10001. **Order by title and SAE report numbers.**

HRB: Highway Research Board, National Academy of Sciences, 2101 Constitution Ave., N.W., Washington, D.C. 20418.

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NHTSA SUBJECT FIELDS AND GROUPS

Entries in **Highway Safety Literature** are arranged under five major **subject fields** (e.g. 1/0 Accidents; 2/0 Highway Safety; etc.). Each major subject field is sub-divided into **subject groups** such as /1; /2; /3, etc. Documents related directly to the National Highway Traffic Safety Administration (NHTSA) are numbered according to the following series: Accident Investigation Reports HS 600 000; Compliance Test Reports HS 610 000; Contractor's Reports HS 800 000; Staff speeches, papers, etc. HS 810 000; Imprints HS 820 000.

Documents containing several articles are announced as a complete volume in the subject category most applicable to it as a whole. Entries for individual articles are listed in their most specific category.

SAMPLE ENTRIES

Subject Categories →

NHTSA Accession No. HS-800 218 Fld. 5/21; 5/9

Title of document: AN INVESTIGATION OF USED CAR SAFETY STANDARDS—SAFETY INDEX: FINAL REPORT. VOL. 6 — APPENDICES G-L

Personal author(s): by E. N. Wells; J. P. Fitzmaurice; C. E. Guilliams; S. R. Kalin; P. D. Williams

Corporate author: Operations Research, Inc.

Pagination →

Publication date: 1969 150p Contract FH-11-6921 Report no. ORI-TR-553-Vol. 6; PB-190 523

Abstract: Appendices G-L to this study of used car safety standards include: indenture model diagrams for classes I-IV motor trucks; degradation, wear, and failure data for motor truck classes I-IV; and safety index tables for classes I-IV motor trucks.

Search terms; Wear; Trucks; Failures; Used cars; Inspection standards

Availability: NTIS

HS-004 497 Fld. 5/19

AUTO THEFT—THE PROBLEM AND THE CHALLENGE

by Thomas A. Williams, Sr.

Journal citation: Published in *FBI Law Enforcement Bulletin* v37 n12 p15-7 (Dec. 1968)

Gives figures on the extent of the auto theft problem and comments on anti-theft devices available now or in the planning stage.

Search terms: Theft; Theft protection; Stolen cars

(Note: If the date of a report or Journal article is not given, the small letters nd will appear)

NOTE: ( ) Numbers in parentheses following certain subject groups indicate the Highway Safety Program Standards (No. 1 and up) and/or Federal Motor Vehicle Safety Standards (No. 101 and up) which may apply to these groups.

1/0 ACCIDENTS 1
- /1 Emergency Services (11, 15-16)
- /2 Injuries
- /3 Investigation (10, 14-15)
- /4 Locations (9, 14)
- /5 Statistical data

2/0 HIGHWAY SAFETY 3
- /1 Breakaway Structures
- /2 Communications
- /3 Debris Hazard Control and Cleanup (15-16)
- /4 Design and Construction (12, 14)
- /5 Lighting (14)
- /6 Maintenance (12)
- /7 Meteorological Conditions
- /8 Police Traffic Services (15)
- /9 Traffic Control (13-14)
- /10 Traffic Courts (7)
- /11 Traffic Records (10)

3/0 HUMAN FACTORS 4
- /1 Alcohol (8, 14)
- /2 Anthropomorphic Data
- /3 Cyclists
- /4 Driver Behavior
- /5 Driver Education (4, 14)
- /6 Driver Licensing (5, 10, 14)
- /7 Drugs Other Than Alcohol
- /8 Environmental Effects
- /9 Impaired Drivers
- /10 Passengers
- /11 Pedestrians (14-15)
- /12 Vision

4/0 OTHER SAFETY-RELATED AREAS 10
- /1 Codes and Laws (6)
- /2 Community Support (17)
- /3 Cost Effectiveness
- /4 Governmental Aspects
- /5 Information Technology
- /6 Insurance
- /7 Mathematical Sciences
- /8 Transportation Systems

5/0 VEHICLE SAFETY 10

*All Federal Motor Vehicle Safety Standards apply to passenger vehicles. An asterisk before a subject group indicates additional types of vehicles to which the indicated standards may apply.

- /1 Brake Systems (102, 105-6, 116)
- */2 Buses, School Buses, and Multipurpose Passenger Vehicles (102-4, 106-8, 111-3, 116, 205-6, 209, 211)
- */3 Cycles (3; 108, 112, 116, 205)
- /4 Design (14; 101-2, 105, 107, 201)
- /5 Door Systems (201, 206)
- /6 Fuel Systems (101, 301)
- /7 Glazing Materials (205)
- /8 Hood Latch Systems (113)
- /9 Inspection (1)
- /10 Lighting Systems (101, 105, 108, 112)
- /11 Maintenance and Repairs
- /12 Manufacturers, Distributors, and Dealers
- /13 Mirrors and Mountings (107, 111)
- /14 Occupant Protection (15; 201-4, 207-10)
- /15 Propulsion Systems
- /16 Registration (2, 10)
- /17 Safety Defect Control
- /18 Steering Control System (101, 107, 203-4)
- /19 Theft Protection (114-5)
- */20 Trucks and Trailers (102-4, 107-8, 112-3, 116, 205-6, 209)
- /21 Used Vehicles
- /22 Wheel Systems (109-10, 211)
- /23 Windshield-Related Systems (101, 103-4, 107, 205, 212)

[redacted]

1/1 Emergency Services

HS-820 214 Fld. 1/1; 2/2

COMMUNICATIONS: GUIDELINES FOR EMERGENCY MEDICAL SERVICES (EMS)

National Hwy. Traf. Safety Administration, N19900

1972 72p

Types of emergency medical services (EMS) communication systems discussed include the universal emergency telephone number, phone and radio patch, paging systems, selective calling methods, physiological monitoring telemetry, hospital communication systems, and medical facility data banks. The role of the FCC in EMS communications is also discussed. Guidelines for implementing an EMS communications systems are provided and the organization of the Oregon EMS communications system is presented as a model.

Search terms: Communication systems; Emergency medical services; Emergency reporting systems; Radio communications; Telephones; Transmission bands; Data transmission; Costs; Oregon; Data banks; Questionnaires; Telemetry; Electronic monitoring systems

AVAILABILITY: GPO $1.00

1/2 Injuries

HS-012 325 Fld. 1/2; 3/2; 5/14; 4/7; 5/4

STAPP CAR CRASH CONFERENCE (16TH) PROCEEDINGS, NOVEMBER 8-10, 1972, DETROIT, MICHIGAN

Society of Automotive Engineers, Inc., S21600

1972 475p refs

Univ. of Michigan, and Univ. of California, San Diego. Includes HS-012 378 through HS-012 398.

Topics include occupant modeling, human body simulation, impact tolerances and injuries, impact tests, restraint system tests, and rollover and rear end accident studies. Special emphasis is given to head and neck simulation models.

Search terms: Human body simulation; Biokinematic models; Occupant modeling; Cadavers in testing; Mathematical models; Biomechanics; Anthropometric dummies; Injury research; Impact tolerances; Acceleration response; Impact tests; Neck motion range; Head motion range; Baboons; Restraint system tests; Restraint system effectiveness; Injury causes; Injury severity; Computerized simulation; Air bag restraint systems; Rollover accidents; Rear end collisions; Neck injuries; Head injuries; Child safety seats

AVAILABILITY: SAE

1/3 Investigation

HS-012 336 Fld. 1/3; 5/20

HIGHWAY ACCIDENT REPORT. TRUCK AUTOMOBILE UNDERRIDE COLLISION ON INTERSTATE ROUTE I-495 NEAR MARYLAND ROUTE 450, NEW CARROLLTON, MARYLAND, JUNE 19, 1970

National Transp. Safety Board, N30000

1971 37p
Report no. NTSB-HAR-71-9; SS-H-12

An overloaded truck, carrying concrete pipe, was traveling north in the right lane of a six lane, divided interstate highway. The engine hood, held closed by a piece of baling wire, flew up in front of the windshield when the wire broke. The driver, his forward view obscured, and stopped. The northbound automobile failed to take evasive action and ran into and under the rear of the truck. The automobile driver and passenger received fatal injuries in this accident. The probable causes of this rear-end underride collision was the stopping of a truck in a high-speed traffic lane by an untrained driver operating an unsafe truck with a makeshift hood fastener, which failed and allowed the hood to obstruct the driver's forward view. The driver of a following automobile was not warned by the truck's emergency flasher lights due to a faulty light switch, and the driver's attempt to stop was unsuccessful.

Search terms: Truck accidents; Accident investigation; Accident case reports; Underride override collisions; Vehicle vehicle collisions; Rear end collisions; Precrash phase; Crash phase; Postcrash phase; Accident scale drawings; Driver fatalities; Passenger fatalities; Accident analysis; Electric system failures; Accident causes; Maryland; Truck defects; Vehicle weight limits; Driver error caused accidents; Hood latch systems

AVAILABILITY: NTIS

HS-800 732 Fld. 1/3

PRODUCTION ENGINEERING OF AUTOMOTIVE TRIAXIAL CRASH RECORDER, MODEL 35500. FINAL REPORT. VOL. 1

by E. W. Hackbarth

Teledyne Geotech, T09550

1972 101p
Contract DOT-HS-141-1-220
Report no. TR-72-5-Vol-1

Report for 1 Jul 1971-30 Apr 1972.

This report covers value engineering and expansion of the capability of the Model 33300 prototype biaxial crash recorder into a Model 35500 automotive triaxial

1/3 Investigation (Cont'd.)

HS-800 732 (Cont'd.)

crash recorder, incorporating the sensing and recording of orthogonal triaxial accelerations; production drawings; production planning, methods, and tooling for the production of 200 to 500 crash recorders per month; and details of a pilot production run of 200 crash recorders.

Search terms: Sensors; Accelerometers; Reliability; Model tests; Specifications; Flow charts; Crash response forecasting; Recorders; Measuring instruments; Magnets

AVAILABILITY: NTIS

HS-800 733 Fld. 1/3

PRODUCTION ENGINEERING OF AUTOMOTIVE TRIAXIAL CRASH RECORDER, MODEL 35500. FINAL REPORT. VOL. 2

by E. W. Hackbarth

Teledyne Geotech, T09550

43p
Contract DOT-HS-141-1-220
Report no. TR-72-5-Vol-2

Report for 1 Jul 1971-30 Apr 1972.

This volume contains instruction documents for vehicle drivers and for the installation, maintenance, troubleshooting, and reconditioning of the crash recorder.

Search terms: Sensors; Accelerometers; Instruction manuals; Maintenance; Repairing; Recorders; Flow charts

AVAILABILITY: NTIS

HS-820 233 Fld. 1/3; 1/5; 1/2

A CHARACTERIZATION OF COLLISIONS, RESULTING DAMAGE AND OCCUPANT INJURY

National Hwy. Traf. Safety Administration, N19900

1972 31p

This study presents data for use in evaluating general structural requirements for experimental safety vehicles. The data were drawn entirely from the automated accident data files of the Highway Safety Research Institute's SPAD time-sharing terminal access system. The data include detail overall accident and damage types, mean impact speeds for various accident configurations, damage extent for different accident types, and mean injury levels and sources of fatal injuries by collisions configurations. An attempt is also made to summarize the collision and injury frequency data to indicate a possible ordering of occupant protection priorities, by the construction of a danger index for each accident type and for each occupant seat position.

Search terms: Accident statistics; Automated accident records; Accident analysis; Fatality causes; Vehicle vehicle collisions; Rollover accidents; Side impact collisions; Front end collisions; Rear end collisions; Head on collisions; Single vehicle accidents; Impact velocity; Injuries by accident type; Damage severity; Injury severity; Deformation; Injuries by seat occupation; Impact forces; Impact caused injuries; Injury prediction from vehicle damage; Impact angle

AVAILABILITY: NTIS

1/4 Locations

HS-012 348 Fld. 1/4; 3/4

NEAR-MISS DETERMINATION THROUGH USE OF A SCALE OF DANGER

by J. C. Hayward

Published in *Highway Research Record* n384 p24-34 (1972)

1972 10refs

Sponsored by the Highway Res. Board Com. on Effectiveness of Operational Measures and the Pennsylvania Transp. and Traf. Safety Center.

Near-miss traffic events have been considered but not adopted as a traffic safety tool because of the high degree of subjectivity involved with their identification. A scale of danger may be applied to a traffic event to facilitate objective measurement and subsequent detection of near-miss situations. The unit proposed is the time measured until collision between two vehicles involved in the unsafe event. Computed from films taken with the Traffic Sensing and Surveillance System of the Federal Highway Administration at an urban intersection, this measure may be used to standardize human observer judgment of dangerous maneuvers and, therefore, make near-miss monitoring a viable alternative to traffic safety determination.

Search terms: Accident risk forecasting; Traffic surveillance; Hazard perception; Driver reaction time; Correlation analysis; Defensive driving; Accident avoidance; Vehicle vehicle interface; Urban intersections; Time factors; Closed circuit television; Collision courses

HS-012 350 Fld. 1/4; 4/7

AN EVALUATION OF THE TRAFFIC CONFLICTS TECHNIQUE

by W. T. Baker

Published in *Highway Research Record* n384 p1-8 (1972)

1972 2refs

Sponsored by the Highway Res. Board Com. on Traf. Records.

The traffic conflicts technique was field tested and an attempt was made to find whether there is a statistical relation between traffic accidents and traffic conflicts. Conflicts were counted at 392 intersections before improvements were made and 173 intersections after construction of the improvements. It appears that those characteristics of intersections that contribute to accident causation can be more readily exposed by using conflicts than by using conventional accident analysis techniques. This may be especially true at low volume rural intersections. Because of this ability to provide more precise information, lower cost remedial actions should result. Correlation coefficients were calculated for bivariate populations of number of conflicts and number of corresponding accidents. The compiled data tend to support a finding that conflicts and accidents are associated.

Search terms: Traffic conflicts; Intersections; Correlation analysis; Tailgating; Left turns; Weaving; Traffic volume; T test; Highway accident potential; Accident rates; Rural intersections; Highway improvements; Accident risk forecasting

1/5 Statistical data

HS-012 373 Fld. 1/5; 5/3

A MOTORCYCLE ACCIDENT STUDY

by A. P. Berenguel

Iowa Dept. of Public Safety, I45770

1971? 40p 4refs

Data used in this study were collected from accident reports involving motorcycles in Iowa for the years 1967 to 1970. Information on the causes of death and types of injuries incurred in fatal and non-fatal accidents as well as demographic characteristics and facts to describe the surroundings of the accident scene are presented. Included are the types of violations committed by the motorcycle driver and the other motor vehicle driver by type of accident.

Search terms: Motorcycle accidents; Motorcycle operator fatalities; Accident types; Accident statistics; Motorcycle operator injuries; Driver characteristics; Accident causes; Vehicle motorcycle collisions; Motorcycle registration; Age factor in accidents; Injury rates; Accident rates; Motorcycle passenger fatalities; Accident location; Accident risks; Accident factors; Month; Fatality rates; Fatality causes; Time of accidents; Day of week; Traffic law violations; Accident responsibility; Iowa

2/0 HIGHWAY SAFETY

2/7 Meteorological Conditions

HS-012 335 Fld. 2/7; 5/20

NOISE CONTROL AT THE OPERATOR'S AREA ON LARGE FARM TRACTORS WITH CABS

by D. R. Hartdegen; H. G. Akins

International Harvester Co., I42000

1972 7p
Report no. SAE-720752

Presented at National Combined Farm, Construction, and Industrial Machinery and Powerplant Meetings, Milwaukee, 11-14 Sep 1972.

Methods used to identify and isolate noise sources in a tractor cab include vibration analysis and frequency identification. Material changes, damping materials, and design changes were tested in the laboratory. Methods used to reduce noise levels were isolation, damping, blocking, and absorption. The end results of this design, test, and sound control approach was a tractor cab combination that averaged from 90.5 dBA with a 1066 diesel hydrostatic tractor to 86.3 dBA with a 1066 diesel gear tractor.

Search terms: Tractor cab interiors; Noise control; Noise sources; Farm tractor design; Vehicle noise; Vibration analysis; Vibration isolators; Vibration control; Sound absorbing materials; Damping

AVAILABILITY: SAE

2/9 Traffic Control

HS-012 328 Fld. 2/9; 3/4

A LABORATORY INVESTIGATION OF SIGNAL INDICATIONS FOR PROTECTED LEFT TURNS

by R. W. Plummer; L. E. King

West Virginia Univ., W14400

197? 13p 6refs

Forty-nine subjects, including male and female drivers and non-drivers, were tested for understanding and comprehension of different types of left turn. The test utilized color slides and color motion picture film segments to present the subject with both steady and flashing left turn signal indications. After each presentation of a signal indication, the subject responded by pressing one of three answer buttons. The accuracy and reaction time of each response were recorded electrically. The results of this investigation show that three signal sequences conveyed their intended messages to the subjects most efficiently of the 14 tested. The results also indicate that none of the flashing signals tested proved to be effective as their meanings were not as readily comprehended as the competing indications.

Search terms: Left turn signals; Design of experiments; Reaction time; Flashing traffic signals; Steady traffic signals; Traffic signal effectiveness; Laboratory tests; Motion pictures; Slides (visual aids)

HS-012 346 Fld. 2/9; 2/5; 5/10

DESIRABLE PRACTICES

2/9 Traffic Control (Cont'd.)

HS-012 346 (Cont'd.)

by M. J. Allen

Published in HS-012 337, *Vision and Highway Safety*, Philadelphia, 1970 Ch10 p177-200

1970

Desirable practices in lighting and reflectorization are presented. Street lighting is shown to be an important supplement to vehicle lighting. Reflectorization of hazards at night serves to increase their visibility by making more efficient use of available light. Reflectorization is desirable for pavement paint, license plates, highway safety signs, street signs, pedestrians, bicycles, slow-moving vehicles, trucks, trains, buses, and automobiles. Fluorescent materials are excellent hazard markers when visibility otherwise is extremely adverse, namely on dreary days and in late afternoon, early morning, and during twilight on clear days. The American system of signs has been under study for a considerable time and improvements have been made but further improvements are needed. It is apparent that for distinctiveness the octagonal and circular signs are the poorest, while the triangular and long rectangular shapes are the best. The European pictorial sign system is briefly described.

Search terms: Street lighting; Headlamp usage; Reflectorized pavement markings; Reflectorization; Fluorescent materials; Vehicle visibility; Traffic signs; Sign visibility; Visibility; International signs; Highway signs; Pedestrian visibility; Highway lighting; Sign shape

HS-012 349 Fld. 2/9

SPEED PROFILES APPROACHING A TRAFFIC SIGNAL

by R. L. Bleyl

Published in *Highway Research Record* n384 p17-23 (1972)

1972 1ref

Sponsored by the Highway Res. Board Com. on Traf. Control Devices.

This study examined and compared the speed profiles of traffic approaching a rural traffic signal under six different signal displays. Detector actuations, signal indications, and timing information were recorded at a remote observation point by using a 20-pen operation recorder. Drivers at the study location entered the intersection more cautiously with a green traffic signal indication or a flashing yellow indication than they did with no signal installed. They did not speed up when signal control was changed from regular stop-and-go operation to flashing operation. Approaching a red signal indication, drivers did not begin to slow down until they were approximately 500 ft. from the signal. Under all other signal displays, drivers generally maintained their speed as they approached the signal location and entered the intersection.

Search terms: Speed patterns; Signalized intersections; Green traffic signals; Flashing traffic signals; Red traffic signals; Amber traffic signals; Traffic data analysis; Deceleration; Traffic signal effectiveness; Rural intersections; Speed reduction; Speed studies

3/0 HUMAN FACTORS

HS-012 374 Fld. 3/0

MANPOWER DEVELOPMENT IN HIGHWAY SAFETY. NEEDS, ISSUES, AND ALTERNATIVES FOR ACTION

Bishop (R. W.) and Associates, B17000

1971 90p 25refs
Contract A70G3

Includes speeches presented at the Manpower Development in Highway Safety Symposium, Atlanta, 27-8 Apr 1971.

Manpower development is an essential means to implementing and optimizing the effectiveness of driver education, emergency medical service, driver testing and licensing, enforcement, and other highway safety program elements. Recommendations regarding manpower development in highway safety are presented. The report concludes that closer coordination and cooperation is needed within and among the levels of government, and between governmental and non-governmental groups. Individuals and groups are more likely to cooperate in implementing plans when they help to develop the plan.

Search terms: Manpower utilization; Education; Intergovernmental relations; Federal role; Local government; State government; Federal state relationships; Highway safety programs

3/1 Alcohol

HS-012 366 Fld. 3/1; 3/4

EFFECTS OF ALCOHOL AND SUBTASK REQUIREMENT UPON CLOSED-COURSE DRIVING BEHAVIOR

by M. S. Huntley, Jr.; M. W. Perrine

Vermont Univ., V04200

1971? 14p 5refs

Presented at Human Factors Society, 15th annual meeting, New York, Oct 1971.

An instrumented car was driven through a closed course by eight subjects on each of two experimental days, with four consecutive trials each day, after ingestion of an alcohol and a placebo beverage, and with and without a concurrent mental arithmetic subtask. Alcohol was associated with overall changes in control use profiles, increased foot control-use rates, and an apparent

reduction in the ability to monitor different controls independently. In addition, alcohol was associated with decreases in driving accuracy. Alcohol's detrimental effects on driving performance may be further influenced by driver personality characteristics and by time-sharing requirements. High extraversion facilitated the accuracy degrading effects of alcohol, whereas the concurrent subtasks requirement attenuated these same effects.

Search terms: Alcohol effects; Driver performance; Driver personality; Blood alcohol levels; Loading (operator performance); Driving task analysis; Instrumented vehicles; Driver behavior; Driver monitoring; Correlation analysis; Driver errors

HS-820 235 Fld. 3/1; 3/7; 1/3

SPECIAL ACCIDENT INVESTIGATION STUDIES: THE ROLE OF ALCOHOL/DRUG INVOLVEMENT

by R. S. Sterling-Smith; J. C. Fell

Boston Univ., B22800; National Hwy. Traf. Safety Administration, N19900

1972 28p 15refs

Presented at the American Assoc. for Automotive Medicine Annual Conference (16th), Chapel Hill, 19 Oct 1972.

A total of 50 accidents involving a fatality during an 8-month period in the Boston area were investigated. A Human Factors Index (HFI) was determined via interviews, records, and questionnaires on each driver designated to be at-fault in the accident. A hypothetical modal operator is described based upon the entire sample. Results discussed include: 42% of the focal operators were under the influence of alcohol at the time of the crash; 60% of the focal operators indicated chronic risk taking behaviors; 62% of the alcohol involved operators were considered to be problem drinkers. Implications pointed to new areas of possible identification criteria for the Boston Alcohol Safety Action Project. A proposed two-year continuation of the study is described.

Search terms: Drinking drivers; Drugs; Accident investigation; Alcohol Safety Action Projects; Multidisciplinary teams; Human factors; Driver behavior; Psychological factors; Driver records; Driver characteristics; Medical factors; Accident research; Boston; Risk taking; Reckless driving; Driver intoxication; Sociological factors; Marijuana; Fatalities; Drug usage; Alcohol usage; Design of experiments

AVAILABILITY: NTIS

3/2 Anthropomorphic Data

HS-012 378 Fld. 3/2

HEAD MODEL FOR IMPACT

by V. R. Hodgson; M. W. Mason; L. M. Thomas

Wayne State Univ., W09600

Published in HS-012 325, *Stapp Car Crash Conference (16th) Proceedings,* New York, 1972, p1-13

1972 8refs
Report no. SAE-720969

A human head model has been developed which is applicable in automobile impact safety tests. Using firm silicon rubber molds made from impressions of cadaver bones, a skull and mandible were each cast in one piece using a self-skinning urethane foam that hardens into cross section geometry similar to the human bone. A rubber gel material is used to simulate the brain. The skull and attached mandible are overlayed with repairable silicon rubber skin having puncture and sliding-over-bone characteristics similar to human skin. Static load-deflection tests and impacts have been conducted on both the model and several cadavers. Results show that the response of the model falls into the cadaver range so that injury indexes can be applied directly to the model. The model is rugged, repeatable, and practical to use in situations where either protection is worn on the head or a frangible head form is desired.

Search terms: Head forms; Human body simulation; Injury severity index; Cadavers in testing; Static tests; Drop tests; Impact forces; Head impact areas; Head impact tolerances

HS-012 379 Fld. 3/2; 4/7

PARAMETER STUDY OF BIOMECHANICAL QUANTITIES IN ANALYTICAL NECK MODELS

by B. M. Bowman; D. H. Robbins

Michigan Univ. Hwy. Safety Res. Inst., M40800

Published in HS-012 325, *Stapp Car Crash Conference (16th) Proceedings,* New York, 1972 p14-44

1972 30refs
Contract FH-11-6962; HSM-099-71-62
Report no. SAE-720957

A parameter study is performed involving several analytical vehicle occupant models in current use with investigation of neck representations a primary goal. A model that replaces the conventional simple ball-joint neck with a two-joint, extensible neck is studied. This model also makes use of joint-stop ellipses to approximate the anatomical range for relatively free angular motion at a joint. Allowance is made for the effect of muscle contraction on occupant dynamics as a function of the degree of voluntary or involuntary tightening of the muscles, based upon experimental findings. A discrete parameter neck model that treats the cervical spine as a linkage of rigid vertebrae and massless, deformable discs is discussed briefly. It is determined that, besides being extensible and having at least two joints, three-dimensional neck representations should account for

3/2 Anthropomorphic Data (Cont'd.)

HS-012 379 (Cont'd.)

coupling between the forces resisting the three possible rotational motions (yaw, pitch, and roll) that can occur between the head and the torso.

Search terms: Occupant modeling; Mathematical models; Biomechanics; Neck motion range; Joint motion range; Human body segment parameters; Human body simulation; Muscular forces; Head motion range; Biokinematic models; Yaw; Pitch; Roll; Flexion; Parameters; Cervical spine; Impact angle; Neck impact tolerances

3/3 Cyclists

HS-800 752 Fld. 3/3

VERIFICATION OF TEST PROCEDURES FOR RULE MAKING–MOTORCYCLE HEADGEAR. FINAL REPORT

by A. Scalone; R. Damis

Brown (Dayton T.), Inc., B28100

1972 174p 4refs
Contract DOT-HS-005-2-336
Report no. DTB06R72-1323

Report for 27 Mar-12 Sep 1972.

This report presents the results of a project to verify performance testing procedures to be incorporated in the federal motor vehicle safety standard for motorcycle headgear. The areas under consideration are: evaluation of impact test procedures for rigid anvil impacts using anthropometric style headforms in three sizes, rigid anvil impacts using a spherical headform, rigid headgear impacts using a spherical headform; construction and testing of the head injury criterion data analysis system; and comparison of past and proposed methods of penetration tests.

Search terms: Headgear; Head impact tolerances; Head forms; Penetration tests; Rule making; Helmet impact tests; Helmet design; Test equipment; Motorcycle safety standards; Helmet standards; Head protection; Headgear laws

AVAILABILITY: NTIS

3/5 Driver Education

HS-012 352 Fld. 3/5; 3/4

DRIVING BEHAVIOR OF YOUNG DRIVER EDUCATION GRADUATES IN SOUTH CAROLINA

by J. D. Williams; P. H. Liu

South Carolina Univ., S28000

1972 39p 3refs
Report no. RR-11

A synopsis of data provided by 2,532 students who have completed driver education in South Carolina is presented. Relationships between driver education grades and permit and licensing examination success are examined. Relationships between having one's own car and high school grades are also explored, as well as car access and weekly mileage driven. Reported weekly mileage is related to high school grades, sex of the student, age of the student, and community size. An analysis is made of night driving behavior, city driving, and interstate driving. The implications of the data for driver education are discussed and a parent-involvement need for driver training is outlined. The data indicates that 16 and 17-year-olds have fatal accident involvement rates (on a mileage basis) more than three times above the state average and total accident involvement rates more than four times greater than the South Carolina average.

Search terms: South Carolina; Driver behavior; Driver education evaluation; Questionnaires; High school drivers; Male drivers; Female drivers; Driver mileage; Driving effect on scholarship; Driver residence; Night driving; Traffic law violations; High school driving courses; Accident rates; Adolescent drivers; Driver license examination

HS-012 353 Fld. 3/5

DRIVER EDUCATION: A SURVEY OF TEACHER PREPARATION AND PERFORMANCE

South Carolina Dept. of Education, S27500

1972 100p 16refs

The two-stage study was designed to assist in the establishment of effective certification requirements for South Carolina's driver education teachers. Results of the study indicated that the in-car phase of driver education should be taught by highly motivated teachers, although the motivation level of the teacher appears to have little effect in the classroom. The study provided no conclusive evidence that increases in formal teacher training result in subsequent increases in teacher effectiveness ratings. The study team suggests that the training curricula which teachers receive on an advanced level be closely controlled to insure uniform effectiveness; and the Federal efforts to develop and evaluate driver education curricula on a performance and task analysis basis be closely examined. Curricula and teaching techniques could be incorporated as a requirement for certification of driver education teachers when the techniques are proven valid.

Search terms: Driver education evaluation; Teacher certification; Questionnaires; Correlation analysis; Instructor training; Curricula; Variance analysis; Classroom driver instruction; Behind the wheel instruction

AVAILABILITY: NTIS

HS-012 375 Fld. 3/5

HOW TO HANDLE DRIVING EMERGENCIES. A PROGRAM FOR DRIVER AND TRAFFIC SAFETY EDUCATION

Highway Users Federation For Safety and Mobility, H13400

1970 110p

Produced with assistance of the Automotive Safety Foundation.

The program is designed to help the driver deal with the following common emergency situations: brake failure, tire failure, steering failure, headlight failure, accelerator sticking, hood flying up, minimizing the consequences of a collision when it cannot be avoided, and skid control. The emergency situations are described, instructions for handling the situations are given, and the successful response times are indicated.

Search terms: Driver education manuals; Driver emergency responses; Brake failures; Tire failures; Steering system failures; Headlamp failures; Accelerator sticking; Hoods; Skid control; Accident avoidance; Driver reaction time; Vehicle control; Accident severity

AVAILABILITY:
Corporate author $2.00

HS-012 376 Fld. 3/5

A RESOURCE CURRICULUM IN DRIVER AND TRAFFIC SAFETY EDUCATION. 2ND ED.

Highway Users Federation for Safety and Mobility, H13400

1972 176p 107refs

The focus of this study is on secondary school driver and traffic safety education. The proposed curriculum presents an overview of the highway transportation system and group objectives, content, and learning activities in three major sections: highway tasks, readiness tasks, and improvement tasks.

Search terms: Driver education manuals; Safety education; Curricula; High school driving courses; Driver performance; Instruction materials; Driving tasks

AVAILABILITY:
Corporate author $2.50

HS-012 377 Fld. 3/5

THE MULTIPLE-CAR METHOD. EXPLORING ITS USE IN DRIVER AND TRAFFIC SAFETY EDUCATION. 2ND ED.

Highway Users Federation for Safety and Mobility, H13400

1972 40p 25refs

The multiple-car method uses an off-street paved area incorporating a variety of realistic traffic situations which will develop the identification, prediction, decision, and execution abilities of driving in high school courses. The multiple-car method permits several automobiles to be operated simultaneously under the direction of one teacher positioned outside the vehicles. The controlled environment provided by a multiple-car facility has several instructional advantages. It helps the student develop basic manipulative skills, perceptual habits, independence, and a sense of responsibility and it allows the teacher to recognize and teach toward individual student differences and perform a more efficient job. Major factors to be considered in planning such a facility (size, design, cost, site selection, and equipment) are discussed. Methods of planning and implementing instruction are suggested.

Search terms: Multiple car driving instruction; Automobile driving ranges; Driver education costs; High school driving courses; Behind the wheel instruction

AVAILABILITY:
Corporate author $1.25

3/6 Driver Licensing

HS-800 747 Fld. 3/6; 4/1

STATE LAWS ON REEXAMINING DRIVERS

National Com. on Uniform Traf. Laws and Ordinances, N14400

Published in *Traffic Laws Commentary* v1 n7 (Nov 1972)

1972 49p 124refs
Contract DOT-HS-107-1-153

The Uniform Vehicle Code requires the department of motor vehicles to reexamine all persons applying for a license renewal. The examination must include a test of eyesight and knowledge of traffic laws. Additionally, the department is given discretionary authority to require any applicant to take and pass other tests deemed by the department to be reasonably necessary to determine the applicant's qualifications according to the class of license for which application has been made. Such tests may also include any or all of the tests required or authorized for an original license applicant. State statutes in the context of comparable provisions in the Uniform Vehicle Code are reviewed.

Search terms: Driver license reexamination; Driver license laws; State laws; Uniform Vehicle Code; Driver license renewal

AVAILABILITY: GPO $.75

3/7 Drugs Other Than Alcohol

HS-012 372 Fld. 3/7

CONFIRMATION OF THE PRESENCE OF MARIHUANA CONSTITUENTS AND THEIR METABOLITES IN THE URINE OF MARIHUANA SMOKERS

by E. J. Woodhouse

Midwest Res. Inst., M45000

3/7 Drugs Other Than Alcohol (Cont'd.)

HS-012 372 (Cont'd.)

1972 10p 6refs

Supported by the Insurance Inst. for Hwy. Safety.

Tetrahydrocannabinol and cannabinol have been identified in the urine of marijuana smokers. Their metabolites are also present. The marijuana constituents and their metabolites were identified by mass spectrometry of organic extracts of the urine. The results indicate that a method for detecting smokers of marijuana is now feasible.

Search terms: Marijuana; Urinalysis; Mass spectrometry; Smoking; Metabolism; Test volunteers

3/8 Environmental Effects

HS-012 345 Fld. 3/8; 2/4; 5/10; 3/11

VISUAL HAZARDS ON STREETS AND HIGHWAYS

by M. J. Allen

Published in HS-012 337, *Vision and Highway Safety,* Philadelphia, 1970 Ch9 p141-76

1970

Nighttime and daytime visual hazards are discussed. Nighttime hazards which reduce visibility include inadequate street lighting, low reflectance asphalt pavements, improper use of reflectors, rain, fog, and insufficient vehicle lighting. Several environmental factors including sun and sky glare, atmospheric boil, mirage effects, camouflage effects, rain, snow, mist, and fog, create daytime visual hazards for drivers. Methods of reducing or eliminating these hazards and improving visibility are presented.

Search terms: Night visibility; Night driving; Hazard perception; Highway lighting; Pavement reflectivity; Contrast; Reflectors; Reflectance; Pedestrian visibility; Vehicle lighting; Wet road conditions; Fog driving; Reduced visibility; Visual acuity; Railroad grade crossings; Vehicle visibility; Time of day; Headlamp regulations; Environmental factors; Glare; Lamp standards; Sidemarker lamps

3/12 Vision

HS-012 337 Fld. 3/12; 5/4; 2/4

VISION AND HIGHWAY SAFETY

by M. J. Allen

Published by Chilton Book Co., Philadelphia, $14.95

1970 264p 858refs

Principles of Optometry Series, vol. 11. Includes HS-012 338 through HS-012 347

Information on the visual aspects of driving, covering driver vision and the visual driving environment, is presented. Topics discussed include vision and the driving task; vision requirements for drivers, vision tests, special visual problems, space perception, and prescribing corrective lenses for driving, as well as, visual problems in the average automobile and visual hazards on streets and highways. Popular misconception about vision and driving are also examined. Methods and procedures for improving drivers' capabilities and the visual driving environment are included.

Search terms: Vision; Vision tests; Vision disorders; Visibility; Vehicle lighting; Highway lighting; Vehicle design; Depth perception; Highway design; Eyeglasses; Hazard perception; Visual acuity; Visual degradation; Visual perception; Reduced visibility

HS-012 338 Fld. 3/12; 3/4; 5/7

THE DRIVING TASK

by M. J. Allen

Published in HS-012 337, *Vision and Highway Safety,* Philadelphia, 1970, Ch2 p5-14

1970

The eye is the only source of driver information about objects on the roadway; that is, their speed, size, course, and possibly hazardous nature. It is the only source of information on roadway signs, traffic signals, and vehicle signals. In addition it is the most important feedback source of information on the effect of compensatory or other motor action of the driver. The driver's visual perception is modified by a certain amount of interference (noise). Sources of visual noise that might cause faulty perception and lead to hazardous actions by the driver are discussed. Methods and procedures for improving driver capabilities and reducing visual noise, thus improving his performance, are included.

Search terms: Driving task analysis; Visual perception; Field of view; Reduced visibility; Glare; Windshield design; Perceptual loads; Automobile design; Visual evoked reaction; Driver confusion; Reflection

HS-012 339 Fld. 3/12; 3/6

VISION REQUIREMENTS FOR DRIVING

by M. J. Allen

Published in HS-012 337, *Vision and Highway Safety,* Philadelphia, 1970 Ch3 p15-21

1970

Visual acuity, peripheral vision, color vision, dark adaptation, glare resistance, reaction time, and ocular muscle imbalance are described. The importance of these visual requirements for safe driving is discussed. It is recommended that dark adaptation, visual reaction time, hyperopia, and eye muscle im-

balance tests become part of the driver license bureau eye test.

Search terms: Visual acuity; Peripheral vision; Color perception; Glare tolerances; Dark adaptation; Reaction time; Vision disorders; Night vision; Visual perception; Vision age changes; Driver vision standards

HS-012 340 Fld. 3/12; 3/4

SPACE PERCEPTION AND DRIVING

by M. J. Allen

Published in HS-012 337, *Vision and Highway Safety,* Philadelphia, 1970 Ch4 p22-8

1970

Without adequate space perception, good visual acuity, color vision, dark adaptation, and fields of vision are not enough to permit safe driving. Adequate clues to space perception and adequate skill in interpreting those clues are essential to safe motoring. The complexity of monocular and binocular clues available to the driver is discussed. These clues include perspective, atmospheric, and illumination clues, binocular parallax, monocular parallax, and velocity judgements.

Search terms: Depth perception; Cues; Perspective; Brightness; Visual perception; Velocity perception; Environmental factors

HS-012 341 Fld. 3/12

VISION TESTS

by M. J. Allen

Published in HS-012 337, *Vision and Highway Safety,* Philadelphia, 1970 Ch5 p29-59

1970

A complete optometric examination is outlined and areas of particular concern in vision tests for drivers are discussed in detail. The visual and ocular examination includes: a case history; a preliminary examination, which involves a search for pathology or abnormality; refraction testing; testing of the fundamental variables of ocular muscle coordination; and special tests to determine specific visual disorders.

Search terms: Vision tests; Visual acuity; Eye movements; Visual fields; Pupil responses; Vision disorders; Refraction; Test equipment; Aniseikonia; Color blindness; Night vision; Glaucoma; Eyes; Driver vision standards; Color perception; Depth perception

HS-012 342 Fld. 3/12; 5/7

PRESCRIBING FOR DRIVING

by M. J. Allen

Published in HS-012 337, *Vision and Highway Safety,* Philadelphia, 1970 Ch6 p60-77

1970

Guidelines for prescribing proper corrective lenses for day and night driving are presented. Nighttime driving may require a different distance prescription than daytime driving. The benefits and/or hazards of sunglasses, yellow lenses, cosmetic tint, windshield tint, and contact lenses are discussed. Next to a good prescription to provide clear, comfortable vision, good headlight aim and clean lights and windows are the most important solutions to glare at night.

Search terms: Eyeglasses; Vision; Sunglasses; Tinted eyeglasses; Tinted windshields; Contact lenses; Lenses; Headlamp aiming; Day vs night performance; Visual degradation; Visual acuity; Field of view; Night vision; Reflecting surfaces; Glare; Eyeglass frames; Fluorescence; Windshield damage

HS-012 343 Fld. 3/12

DRIVERS WITH SPECIAL VISUAL PROBLEMS

by M. J. Allen

Published in HS-012 337, *Vision and Highway Safety,* Philadelphia, 1970. Ch. 7, p78-99

1970

Visual disorders including squint, amblyopia, anisocoria, aniseikonia, cyclophoria, color blindness, glaucoma, albinism, retinitis, uveitis, photophobia, cataracts, and aphakia are described and their effects on the ability to drive safely are discussed. Some possible corrective measures are mentioned.

Search terms: Vision disorders; Aniseikonia; Color blindness; Glaucoma; Albinism; Visual acuity; Cataracts; Photophobia; Age factor in driving; Sex factor in driving

HS-012 347 Fld. 3/12; 5/7; 5/10; 3/4

SOME POPULAR MISCONCEPTIONS

by M. J. Allen

Published in HS-012 337, *Vision and Highway Safety,* Philadelphia, 1970 Ch11 p201-8

1970

Popular views concerning: the value of sunglasses and tinted windshields in reducing glare and improving visibility; the merit in using automobile horns as warning devices; the advisability of watching the turn of front wheels to detect vehicle displacement; the sole importance of central vision in the driving tasks, the recklessness of young drivers; and the hazards of looking at oncoming headlights and high beam glare, are examined and shown to be misconceptions.

3/12 Vision (Cont'd.)

HS-012 347 (Cont'd.)

Search terms: Sunglasses; Glare reduction; Tinted windshields; Horn usage; Highway communication; Visual degradation; Central vision; Peripheral vision; Headlamp glare; High beam headlamps; Adolescent drivers; Young adult drivers

HS-012 367 Fld. 3/12

THE EFFECT OF SELECTED DISPLAY VARIABLES UPON DYNAMIC VISUAL ACUITY

by S. K. Adams

Oklahoma State Univ., O11250

1971? 24p 6refs

Presented at the Human Factors Society 15th annual meeting, New York, 18-21 Oct 1971.

Two experiments were conducted to measure the effects of linear velocity, total viewing time, and display width upon dynamic visual acuity (DVA). Linear velocity and viewing time were found to have significant effects upon DVA. Increases in viewing time often compensated for the decrement caused by high target velocity (250 ft/min. or more). For most inspections, a viewing time of 0.5 seconds or more should be provided. To detect small targets, .19 to .25 mm, a linear target velocity of 50 ft/min. is recommended. Industrial inspectors did not appear to differ significantly from laboratory subjects in dynamic visual acuity. A linear model relating $\log_{10}$ DVA to target velocity and viewing time is hypothesized.

Search terms: Visual acuity; Velocity; Target detection; Time factors; Vision tests; Visual perception; Manufacturing inspection; Mathematical models

4/0 OTHER SAFETY-RELATED AREAS

4/3 Cost Effectiveness

HS-820 232 Fld. 4/3

BENEFIT AND COST ANALYSIS METHODOLOGY–MVP RULE-MAKING PROGRAMS

National Hwy. Traf. Safety Administration, N19900

1972 60p 10refs

This staff paper describes the method developed by the Motor Vehicle Programs to predict the benefits and cost that accrue from implementing individual motor vehicle standards and the composite benefit and cost of all standards considering interaction effects among standards, systems, and programs. The task of estimating benefits and costs is accomplished by an isolation of variables technique that initially assumes constant vehicle life-cycle effects while one-year benefits and costs are calculated. This technique for separating accident variables simplifies the calculation procedures, makes automatic data processing feasible, and generates one-year estimates for benefits and costs. These one-year benefit and cost estimates are applicable to individual safety standards and to systems. The one-year estimates can later be modified by applying appropriate factors to account for actual life-cycle effects.

Search terms: Benefit cost analysis; Vehicle safety standards; Safety standards costs; Safety program effectiveness; Accident costs; Federal control; Accident analysis; Accident types; Rule making; Accident prevention; Damage costs; Accident risks; Time factors

AVAILABILITY: NTIS

4/5 Information Technology

HS-012 351 Fld. 4/5; 4/8

COMPATIBILITY FILE: AN INFORMATION RETRIEVAL SYSTEM

by S. D. Leland; J. W. Burke

Published in *Highway Research Record* n384 p9-16 (1972)

1972

Sponsored by the Highway Res. Board Com. on Traf. Records.

The compatibility file serves as an interface between the transportation planning network files and other data files that are referenced by route number and cumulative mileage. The fundamental purpose of the file is to identify, by route number, each of the highway segments contained in the transportation study's link file and also to identify by route number and cumulative mileage each node or highway intersection. The compatibility file would then be used to relate the computerized transportation study traffic networks to the physical inventory files maintained by the specialty divisions in a department of highway or transportation. The completed file not only provides a means of data exchange but, when used in conjunction with digitized networks and a data plotter, represents an excellent means of file editing and data presentation.

Search terms: Information retrieval; Transportation planning; Road identification; Highway mileage; Inventories; Intersections; Compatibility; Computerized records management; Information systems; Highway planning; Highway coding; Transportation study methods; Coding systems

5/0 VEHICLE SAFETY

5/1 Brake Systems

HS-820 237 Fld. 5/1

DETERMINING THE EFFECTS OF BRAKE DEGRADATION

by G. L. Parker; T. W. Keranen; M. H. Cardon

National Hwy. Traf. Safety Administration, N19900; Bendix Res. Labs., B10200

1973 18p 10refs
Contract DOT-HS-020-1-124
Report no. SAE-730190

Presented at International Automotive Engineering Congress, Detroit, 8-12 Jan 1973.

The study is of the degradation of the brake itself, as compared to control components such as the master cylinder and power boost. The approach involves the use of an inertial brake dynamometer, vehicle computer simulation, and vehicle test. The approach, procedures, and the results of the study of the effects of worn friction materials, worn discs, and drums, and contaminated brakes are presented.

Search terms: Brake wear; Brake tests; Brake drum wear; Brake friction; Dynamometers; Brake temperature; Brake performance; Brake fade; Computerized simulation; Braking; Steering; Disc brakes; Drum brakes

AVAILABILITY: SAE

5/4 Design

HS-012 324 Fld. 5/4

DEVELOPMENT OF A TURBOCHARGED TWO-CYCLE AIR COOLED DIESEL ENGINE

by T. Matsumura

Mitsubishi Heavy Industries Ltd. (Japan), M53000

1972 10p
Report no. SAE-720783

Presented at National Combined Farm, Construction, and Industrial Machinery and Powerplant Meetings, Milwaukee, 11-14 Sep 1972.

Full-scale engine experimentation was carried out using a 4-cylinder prototype engine, after which successive tests were made on each cylinder series of 4-, 6-, and 10-cylinder types. The engine is especially noteworthy for such features of its construction as its mechanically driven exhaust turbocharger, cooling methods for cylinder, cylinder head, and piston. It is considered that the air-cooled engine is likely to encounter more difficulty in reducing thermal load, essential for improving engine performance, than are water-cooled engines. In view of this, there is a general tendency to use air-cooled supercharged engines only for special purposes.

Search terms: Diesel engines; Engine design; Superchargers; Turbochargers; Air cooled engines; Fuel injection; Thermal stresses; Two stroke cycle engines; Engine performance; Exhaust valve design

AVAILABILITY: SAE

HS-012 326 Fld. 5/4

SCANIA'S NEW DS14 DIESEL ENGINE

By O. Lindgren

Saab-Scania A.B. (Sweden), S00100

1972 9p 1ref
Report no. SAE-720782

Presented at National Combined Farm, Construction, and Industrial Machinery and Powerplant Meetings, Milwaukee, 11-14 Sep 1972.

A new model of a turbocharged direct-injection diesel engine has been developed to meet present and near-future power needs for heavy-duty trucks. A description of the V8 design with special emphasis on the turbocharging system including exhaust manifold arrangement and valve timing is given. Design features, such as the oil filtering system, the durable cylinder head sealing arrangement, and the accessory drive are explained. The development and testing program that was undertaken to attain an economic and virtually smoke-free diesel engine of high durability and reliability is described.

Search terms: Diesel engines; Engine design; Fuel injection; Lubrication systems; Engine blocks; Cylinder heads; Crankshafts; Connecting rods; Accessory drives; Turbocharging; Exhaust manifolds; Valve timing; V 8 engines; Engine performance; Cooling systems; Seals; Heavy duty vehicles

AVAILABILITY: SAE

HS-012 327 Fld. 5/4

CUMMINS' NEW 927 IN^3 DIESEL ENGINE

by R. E. Schumann; R. W. Jones

Cummins Engine Co., Inc., C79800

1972 10p
Report no. SAE-720781

Presented at National Combined Farm, Construction, and Industrial Machinery and Powerplant Meetings, Milwaukee, 11-14 Sep 1972.

A heavy-duty in-line 6 cylinder diesel engine has been developed for the truck, construction, industrial, and marine markets. The displacement is 927 in.^{3} with a 5 1/2 in. bore and 6 1/2 in. stroke, with naturally aspirated ratings of 240 and 260 SAE hp at 2100 rpm. Modified from an earlier engine, design changes include angle drilled crankshaft, offset drilled rod, and revised water and lubrication system, to improve the durability of the product.

Search terms: Diesel engines; Engine design; Engine performance; Cooling systems; Crankshafts; Lubrication systems; Heavy duty vehicles

AVAILABILITY: SAE

HS-012 330 Fld. 5/4

CHARACTERISTICS OF COMPENSATED PUMPS

by K. R. Lonnemo

Sperry Rand Corp., S34800

1972 6p 2refs
Report no. SAE-720779

Presented at National Combined Farm, Construction, and Industrial Machinery and Powerplant Meetings, Milwaukee, 11-14 Sep 1972.

The design, steady-state, and typical dynamic performance characteristics of a line of pressure and flow compensated pumps are described. The influence of the application parameters on the dynamic characteristics is discussed and illustrated. Some installation considerations are given and a few successful applications to farm tractors, dozers, trucks, and jumbojets are demonstrated.

Search terms: Pumps; Pistons; Hydraulic equipment; Performance characteristics; Dynamics

AVAILABILITY: SAE

HS-012 344 Fld. 5/4; 5/7; 5/10

VISUAL PROBLEMS IN THE AVERAGE AUTOMOBILE

by M. J. Allen

Published in HS-012 337, *Vision and Highway Safety,* Philadelphia, 1970 Ch8 p100-40

1970

Elements of automobile design which hamper driver vision are discussed and ways of effecting improvements are recommended. Visual problems in the average automobile include glare factors caused by windshields, hood paint, and chromium trim; tinted windshields; window distortions; rearview mirror placement; instrument panel visibility; headlamp glare; headlamp aiming; signal visibility; and vehicle visibility.

Search terms: Automobile design; Vehicle visibility; Reduced visibility; Eye location; Glare reduction; Luminance; Tinted windshields; Field of view; Periscopic rearview mirrors; Instrument panel visibility; Headlamps; Vehicle lighting; Dirt; Signal colors; Headlamp aiming; Windshield angle; Headlamp glare; Signal visibility; Front lamps; Rear lamps; Automobile colors; Glare; Reflecting surfaces; Windshield damage; Tinted glass

HS-800 742 Fld. 5/4; 3/2

HUMAN FACTORS CRITERIA FOR VEHICLE CONTROLS AND DISPLAYS. FINAL REPORT

by T. B. Malone; R. L. Krumm; S. Shenk; H. Kao

Essex Corp., E19400

1972 58p
Contract DOT-HS-120-1-174

Valid criteria were developed for the standardization of control and display location, coding, and operation in passenger cars, trucks, and buses. Five tasks were accomplished. Task 1 comprised an analysis of the commonality of control-display design arrangements in existing vehicles, and an assessment of the degree of the nonstandardization problems. Tasks 2 and 3 were directed toward developing criteria for control/display location and coding/operation respectively. Task 4 involved a study of 3-beam headlamp system control concepts. Task 5 comprised an experimental program to support Tasks 1, 2, and 3.

Search terms: Instrument panel design; Standardization; Control location; Control panels; Display systems; Buses; Driver performance; Automobile interior design; Truck cab interiors; Human factors engineering; Man machine systems; Driving task analysis; Coding systems; Variance analysis; Driver vehicle interface

AVAILABILITY: NTIS

HS-800 743 Fld. 5/4; 3/2

HUMAN FACTORS CRITERIA FOR VEHICLE CONTROLS AND DISPLAYS. APPENDIX A. FINAL REPORT

by T. B. Malone; R. L. Krumm; S. Shenk; H. Kao

Essex Corp., E19400

1972 207p
Contract DOT-HS-120-1-174

A set of controls and displays commonly found in cars, buses, and trucks was assembled and each C/D was analyzed for its use requirements. This analysis initially identified the operations associated with the C/D, both in normal and in contingency (emergency or degraded) situations. Requirements in terms of operator capabilities when using the C/D were identified and effects of environmental conditions were noted. The analysis then proceeded to identify the vehicle state during normal operation of the C/D. Finally, the frequency of use, duration of use, and complexity of use were identified. Frequency of use refers to the relative frequency with which a C/D is operated or used per trip. Duration refers to the time usually required to use the C/D based on factors inherent in the operation and independent of C/D design. Complexity refers to the level of demands for information processing, decision making, precision control, or integrated control/display operation.

Search terms: Instrument panel design; Control location; Control panels; Display systems; Buses; Truck cab interiors; Automobile interior design; Driver performance; Human factors engineering; Man machine systems;

Driving task analysis; Standardization; Perceptual loads; Complexity; Driver vehicle interface

AVAILABILITY: NTIS

HS-800 744 Fld. 5/4; 3/2

HUMAN FACTORS CRITERIA FOR VEHICLE CONTROLS AND DISPLAYS, APPENDIX B. FINAL REPORT

by T. B. Malone; R. L. Krumm; S. Shenk; H. Kao

Essex Corp., E19400

1972 121p
Contract DOT-HS-120-1-174

The development of a standardized instrument panel is described. It was concluded that standardization in individual components alone is inadequate since the driver must interface with a full array of components, arranged in a certain way and interrelated in terms of their location, spatial relationships, operations, and coding. In determining where a control or display should go, its operation and coding, consideration must be given to the other components to be located within each candidate area. The result is to establish criteria for each control and display in terms of its own specific requirements and in terms of its relationships with other controls and displays.

Search terms: Instrument panel design; Control location; Control panels; Display systems; Automobile interior design; Truck cab interiors; Buses; Human factors engineering; Man machine systems; Driving task analysis; Standardization; Driver vehicle interface

AVAILABILITY: NTIS

HS-800 745 Fld. 5/4; 3/4; 3/2

HUMAN FACTORS CRITERIA FOR VEHICLE CONTROLS AND DISPLAYS, APPENDIX C. FINAL REPORT

by R. L. Krumm; T. B. Malone; H. Kao; S. Shenk

Essex Corp., E19400

1972 87p
Contract DOT-HS-120-1-174

Initial experiments measured driver performance in their own vehicles as well as in vehicles of the same class whose panels were unfamiliar. The second series of experiments was concerned with measuring driver performance in vehicles of the same class when these vehicles were equipped with alternative panel configurations. Significant differences were found between performance in familiar and in unfamiliar vehicles with respect to driver reaction times and errors in locating specified controls or displays. These differences were consistent regardless of class of vehicle and were most pronounced for first trial performance. The differences diminished with practice so that five trials were generally sufficient to overcome performance deficiencies on unfamiliar panels.

Search terms: Instrument panel design; Control location; Control panels; Display systems; Human factors engineering; Man machine systems; Driving task analysis; Driver performance; Buses; Truck cab interiors; Automobile interior design; Driver vehicle familiarity; Driver vehicle interface; Driver errors; Driver reaction time

AVAILABILITY: NTIS

HS-800 746 Fld. 5/4; 3/2; 5/10

HUMAN FACTORS CRITERIA FOR VEHICLE CONTROLS AND DISPLAYS, APPENDIX D. FINAL REPORT

by R. L, Krumm; T. B. Malone; H. Kao; S. Shenk

Essex Corp., E19400

1972 24p
Contract DOT-HS-120-1-174

Fifteen control concepts were generated from the possible combinations of control types (buttons, toggles, levers, knobs, rockers), control locations (panel, steering column, floor, wheel) and control motion (fore/aft, up/down, left/right). Based on the rating values for the concepts, the highest four control concepts, switch, spoke button, panel rocker, and left turn signal lever, were selected for further experimental examination. Performance of a beam switching task using four different concepts of controls was tested. As far as the reaction time to the beams was concerned, the panel rocker was found to be the least feasible control, with delta switch different from spoke button. The turn signal switch and the spoke button were not significantly different. Since tracking performance under each control condition did not differ, whatever difference existing among controls may be considered highly significant.

Search terms: Instrument panel design; Control location; Control panels; Display systems; Human factors engineering; Man machine systems; Headlamps; Driver reaction time; Driver vehicle interface; Standardization; Variance analysis

AVAILABILITY: NTIS

5/6 Fuel Systems

HS-012 331 Fld. 5/6

DEVELOPMENT OF A FORMALDEHYDE ANALYZER FOR MOTOR VEHICLE EXHAUST EMISSIONS

by T. H. Johnston; R. V. Marcote; R. Chand

Dynasciences Corp., D36600

1971 100p

5/6 Fuel Systems (Cont'd.)

HS-012 331 (Cont'd.)

Contract CPA-70-170
Report no. 171; PB-210 266

Report for 1 Jul 1970-30 Jun 1971.

An electrochemical transducer which would selectively oxidize formaldehyde in the midst of all of the other gas species present in the exhaust stream of internal combustion engines was developed. The current generated by this device was amplified and displayed to permit quantitative analysis of the formaldehyde concentration. The sensor which was developed was not as selective as proposed, being equally sensitive to all aldehydes. Potential electrode-electrolyte-membrane combinations were evaluated and assessed for potential utility. Electro-oxidation was possible only in a basic electrolyte. The problem of evaluating the sensor's performance necessitated the completion of two significant achievements: production of a reliable formaldehyde standard in the 1 ppm concentration range; and development of a wet method of analysis which would give accurate yet fairly rapid measurements at this low level of pollutant.

Search terms: Formaldehyde; Exhaust emissions measurement; Transducers; Chemical analysis; Electrodes; Electrolytes; Oxidation; Internal combustion engines; Exhaust emissions sampling; Sensors; Exhaust composition; Permeability; Materials tests

AVAILABILITY: NTIS

HS-012 332 Fld. 5/6

MORE EFFICIENT COMBUSTION IN SMALL OPEN CHAMBER DIESEL ENGINES

by R. E. Vanderpoel; J. M. Rife; A. R. Rogowski

American Bosch Corp., A30800; Massachusetts Inst. of Tech., M15000

1972 12p 10refs
Report no. SAE-720775

Presented at National Combined Farm, Construction, and Industrial Machinery and Powerplant Meetings, Milwaukee, 11-14 Sep 1972.

Tests on a 2 1/2 inch bore, short-stroke diesel engine have demonstrated that good efficiency can be obtained through a combination of a large-hole nozzle and the use of air swirl to prevent overpenetration. There is some indication that good efficiency can be obtained over a wider operating range than standard diesel practice. A method of design analysis for this type of engine is presented, along with techniques for estimating the swirl and nozzle design parameters.

Search terms: Diesel engines; Fuel injection; Combustion chambers; Combustion chamber swirl; Nozzles; Injection timing; Engine performance; Engine size; Engine design; Fuel pumps; Fuel sprays; Air fuel ratio

AVAILABILITY: SAE

5/10 Lighting Systems

HS-012 371 Fld. 5/10

DEVELOPMENT OF PLANS FOR PUBLIC EVALUATION OF POLARIZED HEADLIGHTS. FINAL REPORT

by R. H. Hemion; R. W. Hull; D. G. Cadena; B. C. Dial

Southwest Res. Inst., S31800

1971 117p 5refs
Contract FH-11-7349
Report no. AR-815

An evaluation of polarized vehicle headlighting in a large-scale public test was proposed. This study constitutes the preliminary planning for such a test and includes the design of necessary components for modifying vehicles as well as the results of a pilot study utilizing approximately 50 vehicles equipped with polarized headlights. There was virtually unanimous agreement among the participants in the pilot study that polarization provides benefits of improved vision and nighttime driving comfort and is a desirable addition to motor vehicles even though it is more complex in operation and has some inherent problem characteristics not present in current lighting. Polarized headlights provide an acceptable solution to the problem of serious safety hazards in present unpolarized lighting systems.

Search terms: Polarized headlamps; Headlamp tests; High beamed headlamps; Low beamed headlamps; Lighting equipment costs; Glare reduction; Questionnaires; Consumer acceptance; Night visibility; Headlamp design; Night driving

5/14 Occupant Protection

HS-800 748 Fld. 5/14

CHILD RESTRAINT DEVELOPMENT. FINAL REPORT

by V. L. Roberts

Michigan Univ. Hwy. Safety Res. Inst., M40800

1972 133p 15refs
Contract DOT-HS-031-1-180
Report no. UM-HSRI-BI-72-1

Report for 1 Jul 1971-28 Aug 1972.

Two child seats were designed and constructed which gave superior impact protection over those which are available commercially. Performance standards and a compliance test procedure for the evaluation of child seating systems were developed. Test results are presented in graphs.

Search terms: Child restraint systems; Infant restraint systems; Child safety seats; Restraint system tests; Shoulder harnesses; Restraint system design;

Dynamic tests; Compliance tests; Anthropometric dummies; Safety seat design; Performance tests; Impact sleds; Impact tests; Chest acceleration tolerances; Head acceleration tolerances; High speed photography; Seat tests

AVAILABILITY: NTIS

HS-800 749 Fld. 5/14

DEVELOPMENT OF A REAR SEAT INFLATABLE OCCUPANT RESTRAINT SYSTEM. INTERIM REPORT

by D. J. Romeo; R. A. Rose

Cornell Aeronautical Lab., Inc., C67200

1972 97p 7refs
Contract DOT-HS-053-1-168
Report no. ZM-5028-K-1

A series of developmental and evaluation impact sled tests included variations in occupant position and size. The restraint system includes a crushable honeycomb knee bar to limit femur loads and to control the head and upper torso trajectory of the unbelted occupants. Nondeployed protection is provided for crash speed pulses up to approximately 20 mph in order to satisfy multiple impact considerations, and non-vented side bags are used for oblique impact protection. In terms of present injury criteria, the restraint was effective for the 50th percentile adult for crash speeds up to 45 mph (barrier equivalent) for frontal and 30° oblique sled simulated barrier crashes. A performance envelope of crash speed at which protection is provided for other dummy sizes and positions was obtained.

Search terms: Rear seat passengers; Air bag restraint systems; Knee restraints; Impact tests; Anthropomorphic dummies; Chest impact tolerances; Head impact tolerances; Leg impact tolerances; Restrainer bars; Honeycomb structures; Impact sleds; Computerized simulation; Occupant modeling; Injury severity index; Pressure time histories

AVAILABILITY: NTIS

HS-820 234 Fld. 5/14; 1/2

RESTRAINT REQUIREMENTS FOR REAR SEAT OCCUPANTS—EXPERIMENTAL SAFETY VEHICLES

National Hwy. Traf. Safety Administration, N19900

1972 23p

This study presents and summarizes data to be used in evaluating priorities for the expenditure of resources in the development of occupant restraints for the rear seating positions. Data were obtained from files of the Highway Safety Research Institute SPAD time-sharing terminal data access system and from relevant technical reports from the Cornell Aeronautical Laboratory. Information on occupancy rates of the rear seat, use of existing restraint systems, chances of injury, injury severity distributions, and occupant kinematics in an accident is presented. Data on front occupants are included for comparison. The chance of injury, and injury severity for specific body areas, is generally less for rear occupants.

Search terms: Rear seat belts; Rear seat passengers; Fatalities by seat occupation; Occupant kinematics; Injuries by seat occupation; Injuries by body area; Ejection; Occupant positioning; Front seat passengers; Injury severity; Seat belt usage by seat occupation; Injury statistics; Injuries by accident type; Injuries by age; Injury probability; Impact caused injuries; Automated accident records; Seat occupation

AVAILABILITY: NTIS

5/18 Steering Control System

HS-012 333 Fld. 5/18; 5/20

ARTICULATED VEHICLE ROLL: EFFECT ON INVERTING THE COUPLING

by K. E. Holmes

Transport and Road Res. Lab. (England), T33900

1972 15p 1ref
Report no. TRRL-LR-464

The usual form of coupling connecting the tractor and trailer units of an articulated vehicle combination permits an increasing amount of trailer roll as the articulation angle increases, a defect which can be avoided by inverting the coupling. Tests have been carried out to assess the benefits from this modification in the case of road tankers of relatively stable design (low center of gravity). In the tests the speed at which the vehicles negotiated S-shaped curves was gradually increased until either the vehicle could go no faster or it became unstable in roll. With the normal coupling, unstable roll arose at a centrifugal acceleration in the region of 0.41 - 0.42 g. With the inverted coupling unstable roll had not developed at 0.44 g, the highest centrifugal acceleration achieved (a limit set by the power of the vehicle). The advantage from inverting the coupling would be expected to increase as the height of the center of gravity of the loaded tanker is increased.

Search terms: Fifth wheel couplers; Tractor trailers; Roll; Vehicle center of gravity; Articulated vehicles; Truck stability; Turning radius; Pitch; Yaw

5/20 Trucks and Trailers

HS-012 334 Fld. 5/20

AUTOMATIC SHIFT CONTROL FOR HEAVY DUTY TRANSMISSIONS

5/20 Trucks and Trailers (Cont'd.)

HS-012 334 (Cont'd.)

by J. W. Schmidt

General Motors Corp., G06600

1972 11p
Report no. SAE-720753

Presented at National Combined Farm, Construction, and Industrial Machinery and Powerplant Meetings, Milwaukee, 11-14 Sep 1972.

In 1968 an electric shift control concept was introduced for the off-highway heavy duty transmission market to eliminate the problems associated with mechanical, hydraulic, and air linkages. This system consisted primarily of three components: shift tower, wiring harness, and range selector control valve body. A new electronic shift control has been developed which enables the transmission with electric shift to achieve the optimum in fully automatic operation. The electronic control ensures that all shifts occur at optimum speeds, eases driver operation, and provides a unit that is precise, reliable, maintenance-free, and adaptable to large and complex vehicles. The new shift control combines electronics and hydraulics to automate the shifting of the heavy duty transmission.

Search terms: Heavy duty vehicles; Gear shifting mechanisms; Automatic transmission design; Automatic control; Electronic devices in vehicles

AVAILABILITY: SAE

HS-012 364 Fld. 5/20; 5/18

AN ACTIVE SEAT SUSPENSION SYSTEM FOR OFF-ROAD VEHICLES

by L. F. Stikeleather; C. W. Suggs

Published in *Transactions of the ASAE* v13 n1 p99-106 (Jan-Feb 1970)

1970 14refs

Presented at the American Society of Agricultural Engineers winter meeting, Chicago, Dec 1968, as Paper No. 68-632.

To adequately protect machine operators from terrain-induced vibration, a suspension capable of providing near complete isolation in the frequency range of 3 to 5 Hz must be incorporated. The major emphasis of this work was directed toward a suspension for the operator's station and/or seat so as to be pertinent to the largest number of vehicle types. The system was developed as a displacement controller. Basically it can be thought of as two separate subsystems: the input displacement transducer and the automatic feedback position control loop which forms the actual load supporting link between seat and chassis.

Search terms: Suspension systems; Off the road vehicles; Vibration control; Seat design; Displacement; Hydraulic equipment; Feedback control; Transfer functions; Ride simulators; Damping; Servomechanisms; Stochastic processes; Vibration isolators; Frequency modulation; Vibration protection; Transducers

HS-012 365 Fld. 5/20

SYSTEMS SAFETY IN RECREATIONAL AND POWERED GARDEN VEHICLES

by V. M. Sowa, Jr.; T. M. Fraser

Waterloo Univ. (Canada), W09000

1971? 12p 10refs

This paper discusses the development of a standardized dynamic evaluation process which will be applicable to specialized powered consumer vehicles on which the operator rides. The standardized process will be suitable for evaluation of vehicles with specialized functions such as boats, lawnmowers, snowmobiles, all-terrain vehicles, golf carts, industrial vehicles, and farm equipment. The proposed method differs from existing practices, which are usually limited to employing static human engineering standards in vehicle design and testing, and generally give inadequate consideration to dynamic operating influences. The vehicle should be considered as a dynamic man-machine system operating within a variety of dynamic environments. Only by such complete analysis will adequate safety be assured.

Search terms: Recreational vehicles; Garden tractors; Safety design; Human factors engineering; Vehicle dynamics; Man machine systems; Control equipment; Manufacturers liability; Strict liability; Product safety; Systems analysis

5/21 Used Vehicles

HS-820 238 Fld. 5/21

AN IN-DEPTH LOOK AT THE SAFETY STATUS OF VEHICLES ON THE UNITED STATES HIGHWAY

by F. G. Fisher, Jr.; G. Parker

Ultrasystems, Inc., U00800; National Hwy. Traf. Safety Administration, N19900

1973 22p
Contract FH-11-7525
Report no. SAE-730229

Presented at International Automotive Engineering Congress, Detroit, 8-12 Jan 1973.

The study was conducted to determine the in-use conditions of automobiles as a function of age, mileage, model year, make, and model. In order to minimize the variances that ensue when data are collected from various sources, criteria were developed for selecting qualified diagnostic centers. Standard component test criteria were also developed for evaluating tested components as either

pass or defective. A vehicle-condition computer data model was constructed to verify vehicle outages at the subsystem, component group, and component levels. The computer program performed a preliminary statistical analysis of the data parametrically and also generated plots of average percentage outages against specified parameters. The validity and reliability of the data assure that statistical findings are at least significant at the 5% level. The results show that vehicles in states with periodic inspection are in much better condition than those in states with random inspection.

Search terms: Vehicle age; Vehicle mileage; Automobile models; Vehicle inspection; Vehicle safety; Vehicle sampling; Diagnostic centers; Computerized simulation; Inspection procedures; Used automobiles; Defects; Data acquisition; Data analysis

AVAILABILITY: SAE

5/22 Wheel Systems

HS-012 354 Fld. 5/22; 1/3

THE ROLE OF TIRES IN VEHICLE ACCIDENTS

by A. J. White

Motor Vehicle Res. of New Hampshire, M63000

1973 509p 4refs

Vol. 5 of *Research Dynamics of Vehicle Tires.* Includes HS-012 355 through HS-012 362.

Examples of tire failure caused accidents are given and the importance of investigating tire failure to determine the cause of accidents is stressed. Tire failure may be caused by valve stem damage during mounting or servicing, defective or improper tire repair, tire impact fracture, defective new tires, defective wheel rims, cutting or puncture of the tire by foreign objects on the roadway, and retreading of deteriorated or otherwise damaged casings. Investigation procedures to determine the cause of tire failure are given and the investigative and expertise requirements for tire failure accident investigation are mentioned. Detailed photographs of tire failures and defects are included.

Search terms: Tire failure caused accidents; Tire failures; Valve stems; Tire repair; Defective tires; Tire damage; Rim failures; Foreign objects; Tire cuts; Accident investigation; Retreaded tires

HS-012 355 Fld. 5/22; 1/3

EXAMPLES OF TIRE FAILURES IN ACCIDENTS

by A. J. White

Published in HS-012 354, *The Role of Tires in Vehicle Accidents,* Lee, N.H., 1973 p11-78

1973

Several accidents involving tire failure were investigated and the tires examined to determine cause of failure. Causes of tire failure included internal damage, careless tire mounting, tire puncture, and tire overloading. Methods of examining the tires are described. Detailed photographs are included.

Search terms: Tire failure caused accidents; Tire tests; Tire damage; Tire maintenance; Tire failures; Tire tread depths; Accident case reports; Accident investigation; Valve stems; Tire mounting; Tire loads; Inner tubes; Sealers; Photographs; Tire inflation pressure; Tire punctures; Tire valves; Laboratory tests

HS-012 356 Fld. 5/22; 5/11; 1/3

TIRE VALVES—TIRE REPAIRING

by A. J. White

Published in HS-012 354, *The Role of Tires in Vehicle Accidents,* Lee, N.H., 1973 p79-138

1973

Cases of tire failure caused accidents due to improper repair and valve stem damage are examined. Several types of tubeless tire valves are shown. Valve stems may be damaged in mounting or servicing or by misalignment with wheel covers. Tire failure accidents resulting from improper repair of a defective new tire and defective repair of a punctured tire are also investigated. Tire explosions are mentioned. Detailed photographs are included.

Search terms: Tire tests; Tire failure caused accidents; Defective tires; Valve stems; Tire mounting; Tire repair; Accident investigation; Accident case reports; Accident reconstruction; Tire valves; Laboratory tests; Photographs; Tire beads; Tire failures; Tire punctures; Tubeless tires

HS-012 357 Fld. 5/22; 1/3

IMPACT—A CAUSE OF INJURY RESULTING IN TIRE FAILURE

by A. J. White

Published in HS-012 354, *The Role of Tires in Vehicle Accidents,* Lee, N.H., 1973 p139-212

1973

No tire failures offer a greater challenge to the skills of an examiner attempting to determine failure causes than those tires which failed due to impact. Tires do not always fail immediately after impact but sometimes continue in service for some time after impact. Tire impact damage often gives no warning to the vehicle operator that a potential tire failure has been initiated. Once initiated, the tire damage grows in magnitude with further tire use until the structure of the tire reaches a point where it cannot resist the forces acting on it and failure occurs.

5/22 Wheel Systems (Cont'd.)

HS-012 357 (Cont'd.)

Cases involving tire failures caused by impact damage are presented. Detailed photographs are included.

Search terms: Tire failures; Tire tests; Impacts; Tire cuts; Tire failure caused accidents; Accident investigation; Accident case reports; Tire defects; Tire beads; Tire damage; Bus tires; Tire tread separation; Photographs

HS-012 358 Fld. 5/22; 1/3

DEFECTIVE NEW TIRES

by A. J. White

Published in HS-012 354, *The Role of Tires In Vehicle Accidents,* Lee N.H., 1973 p213-316

1973

Examples of defective new tires and of accidents caused by defective new tire failures are presented. Defects discovered in the defective new tires include: tire bead distortion; off-set breaker ply systems; butress area circumferential separation; tire cover separation; circumferential fracturing of sidewall; folding of cord ply; and separation of the cover stock caused by adhesion breakdown. Tire investigation procedures are discussed. Detailed photographs are included.

Search terms: Defective tires; Tire failures; Tire tests; Tire defects; Tire failure caused accidents; Truck tires; Tire manufacture; Inner tubes; Radial tires; Tire beads; Separation; Wide oval tires; Photographs; Stress (mechanics); Tire cords; Tire sidewalls

HS-012 359 Fld. 5/22

DEFECTIVE WHEEL RIMS CAUSING ACCIDENTS

by A. J. White

Published in HS-012 354, *The Role of Tires In Vehicle Accidents,* Lee, N.H., 1973 p317-46

1973

Many non-functional wheel-rim designs created to give a sporty appearance were found to be faulty. Tire deflation caused by use of these wheel-rims occurred as a result of air leaks through the rim and along the lengths of the rivets. The incompatibility of metals used in the wheel-rim construction makes these wheel-rims unsafe when used with tubeless tires. Rivet heads in these designs could cause inner-tube failure if the wheel-rims were used with tube-type tires. Some designs of these wheel-rims used other fastening means which precluded inflation air losses from tubeless tires. Tire failure caused accidents as a result of impact to the tire, wheel-rim flange failure, and puncture are described in detail. Detailed photographs are included.

Search terms: Rims; Wheel design; Accident case reports; Accident investigation; Stress (mechanics); Rim failures; Tire failures; Tire failure caused accidents; Tire tests; Impacts; Tire damage; Laboratory tests; Fatigue (materials); Tire punctures; Photographs; Tubeless tires

HS-012 360 Fld. 5/22; 1/3

ROAD HAZARDS

by A. J. White

Published in HS-012 354, *The Role of Tires In Vehicle Accidents,* Lee, N.H., 1973 p347-414

1973

Tire failures caused by punctures, cuts or impacts with foreign objects on roadways are discussed. Tire failure investigations are presented. Pneumatic tires can be damaged in many ways depending upon the angle of impact and the configuration of the object struck. The use of protective tire chains on off the road vehicles to prevent tire damage is also discussed. Detailed photographs are included.

Search terms: Tire failures; Tire tests; Impact hazards; Tire failure caused accidents; Accident case reports; Debris; Accident investigation; Rims; Tire chains; Tire test equipment; Tire cuts; Foreign objects; Tire damage; Photographs; Impacts; Tire punctures; Motorcycle accidents; Fracture mechanics; Valve stems

HS-012 361 Fld. 5/22; 1/3

INVESTIGATIVE PROCEDURES OF TIRE FAILURE

by A. J. White

Published in HS-012 354, *The Role of Tires in Vehicle Accidents,* Lee, N.H., 1973 p415-480

1973

The simple determination that a tire failed and caused an accident is not sufficient to be classed as a total accident reconstruction. The cause of the tire failure must be determined in order to establish liability. Procedures for inspecting and testing tires to determine causes of tire failure are discussed. Specific cases of tire failure caused accident investigation are presented. Detailed photographs are included.

Search terms: Tire tests; Accident investigation; Accident reconstruction; Tire failure caused accidents; Tire defects; Tire mounting; Wide oval tires; Photographs; Inner tubes; Accident case reports; Separation; Legal factors; Tire sidewalls; Impacts

HS-012 362 Fld. 5/22

RETREAD TIRES

by A. J. White

Published in HS-012 354, *The Role of Tires in Vehicle Accidents*, Lee, N.H., 1973 p481-98

1973

Cases involving retreading of dangerous tires and defective retreading are discussed. One of the major problems of the retreading industry is securing acceptable tire carcasses for processing. Some retreaders have used questionable worn-out tires in their retreading process in order to fill inventory gaps or orders. Prior to the time they reach the initial inspection stage at a retreading plant, tires are subjected to many storage conditions which cause degradation acceleration. A regulation to have all tires manufactured with a date of manufacture legend and forbid retreading of these tires sometime after this date is recommended. Detailed photographs are included.

Search terms: Retreaded tires; Tire failures; Tire defects; Tire wear; Tire tests; Tire casings; Deterioration; Cracking; Separation; Photographs

*U.S. GOVERNMENT PRINTING OFFICE 513-005

SPECIAL NOTICE

The Highway Safety Literature file is available for computer searches by the highway safety community. Citations contained in the file cover the period 1967 through 1972; all are unclassified and unlimited. Although there are certain outdated and incomplete data in the older citations, every effort is being made to eliminate or update them. To use the HSL system, searchers must have a 2780 compatible terminal on "dial-up" telephone service. For further information, contact:

Director
Office of Administrative Services (N48-50)
National Highway Traffic Safety Administration
400 7th Street, S. W.
Washington, D. C. 20590

NHTSA CONTRACT AWARDS

Abstracts are arranged by contract number (e.g. DOT-HS-018-3-597)

DOT-HS-017-1-017 IA. Mod. 3

IMPACT BIOMECHANICS AND PROTECTION SYSTEM STUDIES

Aerospace Medical Research Laboratory
Wright-Patterson AFB
Ohio

27 Jan 73 to 28 Jan 74

$180,000

The objectives of this study are: to determine the effects of various restraint systems on dummies, animals, and human subjects in stationary and dynamic conditions which simulate impact and/or crash environments; to evaluate simulation, scaling and instrumentation techniques and determine their effectiveness in extrapolating simulated test conditions to the real world crash environment; to determine the injury levels in male adult baboons produced by crash protection restraint systems in dynamic tests using the "stepped severity" concept. An experimental design will be established in consultation with the NHTSA by which the number of animal subjects and tests to be performed can be held to a minimum. The scope of the overall research effort of which this agreement forms a part, includes investigations to determine the categories and probabilities of injuries resulting in baboons, cadavers, and humans restrained by various restraint configurations and impacted in the $-G_x$ direction. The types of injuries to be studied in all cases may be severe and in some cases may be incapacitating or lethal. These tests shall be conducted in such a manner that the resulting data may be correlated to data obtained from similar tests previously conducted with aircraft and/or automotive lap belt and shoulder harness configurations and air cushions.

DOT-HS-021-2-472. Amend. 1

STATE ACCIDENT DATA. NATIONAL ACCIDENT SUMMARY

Safety Management Institute
2139 Wisconsin Avenue, N.W.
Washington, D.C. 20007

16 Feb 73 to 27 Dec 73

$49,370

The 1971 State Accident Data. NAS contract is modified to add the following: The contractor shall accept initial 1972 State Accident Data Tape data submissions from as many as fifteen (15) States on other than a quarterly basis and provide computer support required to extract the SADT data on a quarterly basis. The contractor shall reformat the SADT files to the Uniform Accident Data File as specified by NHTSA and then to the National Accident Summary files for as many as twenty (20) additional jurisdictions. The additional jurisdictions may include States which will begin participation in the program in calendar year 1973 due to changed State Accident data systems. The contractor shall prepare documentation based upon the 1972 accident data submitted by each individual State. The documentation shall be in a form suitable for NHTSA to distribute to the State and shall include, but not be limited to, univariate distributions obtained from the data which differs significantly from the nationwide accident experience as reflected in the National level NAS.

DOT-HS-026-3-605

UNIFORM TIRE QUALITY GRADING - TREADWEAR

Compliance Testing, Inc.
Post Office Box 351
Ravenna, Ohio 44266

19 Jan 73 to 23 Oct 73

$14,996

This program has the following objectives: to determine the suitability of the A.S.T.M. G78-15 standard traction tire as a control for treadwear tests; to test, in a preliminary way, whether one control tire will be suitable for all types of tire construction. Other types of tires to be tested are: 205-15(4PR)-radial, G78-15(4PR)-belted polyester/glass, G78-15(4PR)-bias nylon-4 ply.

DOT-HS-027-2-366. Amend. 3

TESTS OF CHEVROLET VEGA FRONT BUCKET SEATS

General Environments Corporation
General Testing Laboratories Div.
6840 Industrial Road
Springfield, Virginia 22151

Period Covered: Two months from receipt of specified seats

$4,710

The contractor shall test six (6) each Chevrolet Vega front bucket seats to FMVSS 202 and 207, in accordance with NHTSA Laboratory Test Procedures dated November 5, 1971. Seats are to be tested using a test fixture simulating automobile installation.

DOT-HS-027-3-629

TESTING OF TWO SCHOOL BUSES FOR CONFORMANCE WITH FEDERAL MOTOR VEHICLE SAFETY STANDARDS

General Environments Corporation
6840 Industrial Road
Springfield, Virginia 22151

Period covered: 6 weeks from receipt of first vehicle; additional week for second vehicle

$17,553

Testing to FMVSS numbers 101, 103, 107, 112, 113, 205, 208, and Part 567 shall be in accordance with testing procedures specified in those safety standards. Testing to FMVSS numbers 102, 104, 108, 116, 207, 209, and 210 shall be accomplished as outlined in the NHTSA Laboratory Test Procedures. The contractor shall implement and maintain a measurement and test equipment calibration system in accordance with established calibration practices.

DOT-HS-069-3-613

DYNAMIC HEAD FORM IMPACT TEST - CHILD RESTRAINTS

VPI Industry Center
R.R. 1, Box 214
Rocky Mount, Virginia 24151

6 Feb 73 to 3 May 73

$8,914

Objectives of this test program are: (1) to conduct a series of dynamic headform tests on specific areas of existing child restraint devices to determine the state-of-the-art in head protection, (2) to determine the superior test method for conducting dynamic headform tests on all types of child restraint systems, (3) to determine the suitability and practicability of the proposed headform test particularly with regard to test result repeatability. Data required are: child restraint tested; vehicle seat and seating position used for test; headform weight; headform velocity; force (and g's) on the headform during each 1/2 inch of pad or system deflection; maximum peak force on headform (F=W G peak); resultant "g level" on the headform; repeatability of the specific test series; simple test procedure to verify displacement versus time, as well as force versus time, plot of force versus displacement.

DOT-HS-095-3-628

METALLURGICAL ANALYSIS OF SIX (6) G.M. 1/2 TON SINGLE PIECE TRUCK WHEELS

Norman N. Breyer and Associates
3300 South Federal Street
Chicago, Illinois 60616

Period covered: Three (3) months after receipt of the six wheels

$4,200

The contractor, after receiving from the Government six (6) size 15 x 5.5 inch G. M. 1/2 ton single piece truck wheels, shall analyze and test said wheels in accordance with the detailed requirements as follow: examine and photograph each wheel in the as received condition, recording the pitting and the relationship to tire fabric configuration; record the failure initiation photographically; remove the paint and examine the wheels using magnetic particle inspection; recheck suspicious regions using dye penetrant inspection; record photographically and graphically where these suspect or positive indications are located; suspicious secondary cracks should be exposed and examined visually using macro and microscopic techniques and recorded photographically; determine the nature of any growing cracks employing electron microscopic techniques; perform chemical and hardness tests on each of the six wheels; study the effects of metallurgical design and manufacturing factors in the production of this wheel.

DOT-HS-120-3-544 Task Order No. 4

METALLURGICAL/ENGINEERING INVESTIGATION OF 1973 PLYMOUTH VALIANT FRONT SUSPENSION BOLTS AND NUTS

Essex Corporation
303 Cameron Street
Alexandria, Virginia 22314

23 Feb 73 to 10 Mar 73

$2,475

The purposes of this work are to determine why the threads of the front suspension nut were stripped when it was being tightened to 65 foot pounds on the front suspension bolt, and to determine if there are any deviations for either the bolt or nut from engineering drawings. The metallurgical examination is to include: photographic documentation, visual and stereomicroscopic examination, dye penetrant and dimensional inspections, chemical analysis, and hardness tests. The engineering investigation is to include an investigation of the effect each of the following would have on the vehicle's steering geometry, stability, braking, and directional control: a stripped nut, the loss of right rear cam bolt nut, the complete loss of the right rear cam bolt nut and assembly.

DOT-HS-223-2-383. Task Order No. 6

INSPECTION OF 1972-1973 AMBASSADORS AND MATADORS

The Automobile Club of Southern California
P.O. Box 2890 Terminal Annex
Los Angeles, California 90051

13 Feb 73 to 16 Apr 73

$3,049

The contractor shall perform inspection of 1972-1973 Ambassadors and Matadors to determine if front suspension attachments are properly secured. Twenty five (25) vehicles shall be inspected and tested for looseness of the following attachments: strut rod to lower control arm, strut rod cushion nut, strut rod jamb nut, steering chuck to sill mounting, lower control arms to cross

member, disc brake caliper mounting bolt, idler arm to sill, idler arm nut. On the following attachments, whether or not they are loose, existing torques shall be checked and recorded; and if outside of specification, tightened to proper torque: strut rod bracket to sill, upper control arm bolt, lower shock absorber nuts.

DOT-HS-303-3-576

VEHICLE LEASE AGREEMENT BETWEEN NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION AND PETERSON, HOWELL AND HEATHER, INC.

Peterson, Howell and Heather, Inc.
2701 North Charles Street
Baltimore, Maryland 21218

Period Covered: Fifty months after cars are delivered

$54,000

General Motors Corporation has produced a limited number of passenger cars equipped with air cushions and is desirous of obtaining field experience with cars so equipped. The sublessee, Peterson, Howell, and Heather, Inc., shall notify GM of any problem experienced with activation of the air cushion or failure of the readiness light indicator.

DOT-HS-311-3-596

TESTING OF FORD EXPERIMENTAL SAFETY VEHICLES AT DYNAMIC SCIENCE, PHOENIX, ARIZONA

Ford Motor Company
Special Purpose Vehicle Operations
19855 Outer Drive
Post Office Box 1748
Dearborn, Michigan 48121

08 Dec 72 to 01 Jul 73

$62,537

The primary purpose of this program is to provide support to the Government's independent ESV test contractor, Dynamic Science, at their test site in Phoenix, Arizona. Ford shall furnish necessary engineering, maintenance, and manufacturing support during the accident avoidance and crash testing of the Ford ESV in the form of personnel, services, parts, and materials, both on-site in Phoenix, Arizona, and at Ford facilities and allied divisions as required, and will also include delivery of vehicle as specified.

DOT-HS-316-3-604

IMPLEMENTATION AND OPERATION OF FATALITY ANALYSIS FILE

State of Arizona
Arizona Highway Department
206 South 17th Avenue
Phoenix, Arizona 85007

15 Jan 73 to 01 Jan 74

$16,744

The objective of this effort is to establish a research oriented file of highway fatalities in support of the Alcohol Countermeasures Program. The contractor shall forward manually encoded cases of fatal accidents on a monthly basis. Data sources specified are: official enforcement officers' traffic accident reports, driver history files, death certificates, coroner's reports, hospital records, health department records.

DOT-HS-319-3-615

IMPLEMENTATION AND OPERATION OF FATALITY ANALYSIS FILE

State of West Virginia
Governor's Highway Safety Administration
922 Quarrier Street
Charleston, West Virginia 25301

01 Feb 73 to 01 Feb 74

$13,288

The objective of this effort is to establish a research oriented file of highway fatalities in support of the Alcohol Countermeasures Program. The contractor shall forward manually encoded cases of fatal accidents on a monthly basis. Data sources specified are: official enforcement officers' traffic accident reports, driver history files, death certificates, coroner's reports, hospital records, health department records.

DOT-HS-321-3-620

IMPLEMENTATION AND OPERATION OF FATALITY ANALYSIS FILE

State of Alaska
Department of Public Safety
Pouch N
Juneau, Alaska 20590

1 Feb 73 to 1 Jan 74

$2,428

The objective of this effort is to establish a research oriented file of highway fatalities in support of the Alcohol Countermeasures Program. The contractor shall forward manually encoded cases of fatal accidents on a monthly basis. Data sources specified are: official enforcement officers' traffic accident reports, driver history files, death certificates, coroner's reports, hospital records, health department records.

DOT-HS-322-3-621

TEST AND ENGINEERING SUPPORT FOR THE ESV PROGRAM

Battelle Memorial Institute
Columbus Laboratories
505 King Avenue, Columbus, Franklin,
Ohio 43201

13 Feb 73 to 16 Feb 74

$57,975

The contractor shall monitor design optimization work including cost-effectiveness studies that will lead to refined ESV performance specifications. The contractor shall prepare information, analyze data, and monitor tests to assure completion of testing the GM and Ford ESV prototypes. Additional runs with the computer crash model developed under contract no. FH-11-7550 shall be conducted to validate and analyze ESV crash test data. The model also will be used: to generate parametric information on structures for a range of current domestic and foreign vehicles to permit use of the computer crash model in analyzing aggressiveness in car to car collisions; to analyze large vehicle and little vehicle cross section as a function of crush; to determine multimass inertia effects relative to bumpers and engines; to provide V^X for values of X other than 2 to determine the acceleration versus impact velocity characteristics of the energy absorbers during the stroke of velocity sensitive systems. The contractor shall provide analytic and experimental support for design evaluations relative to the following vehicle impact modes and conditions: intermediate speeds; off-angle crashes; different size dummies; panic braking; pedestrian impacts; rollover; and possible effects of significant extremes in ambient temperatures on energy absorbers, sensors, and controls.

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